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# **Winning with Green Remediation Practices at the Former McClellan AFB, Sacramento CA**

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# Overview

- McClellan History
- Remediation Programs
  - Groundwater
  - Soil vapor extraction
  - Fuels bioventing
  - Soil Cleanup
- Right Sizing
  - Reduces environmental impacts
  - Reduces energy demands
  - Increases sustainability
  - Saves taxpayers' money



# Location and History



- McClellan was a large, industrial city
  - Sept. 1936 base opened
  - 1995 BRAC listed
  - July 2001 base closed





# McClellan History

- McClellan's mission was repair depot and system management
  - Aircraft
  - Communications
  - Electronics
  - Space
- 1979 groundwater contamination discovered
- 1987 placed on EPA National Priorities List





# Background

- Extensive soil and groundwater contamination
  - Primarily solvents (TCE, PCE)
  - Metals (lead, cadmium, chromium)
  - Fuels (gas and diesel)
  - Radiological (Radium 226)
- Largest cleanup effort in the Air Force
  - 318 sites
- Interbedded (sand, silt, clay) geology presents challenges (low permeability)
- BRAC cleanup Team
  - Air Force
  - EPA Region IX
  - State of California





# Remediation Programs

- Groundwater
- Soil vapor extraction
- Fuels bioventing
- Soil

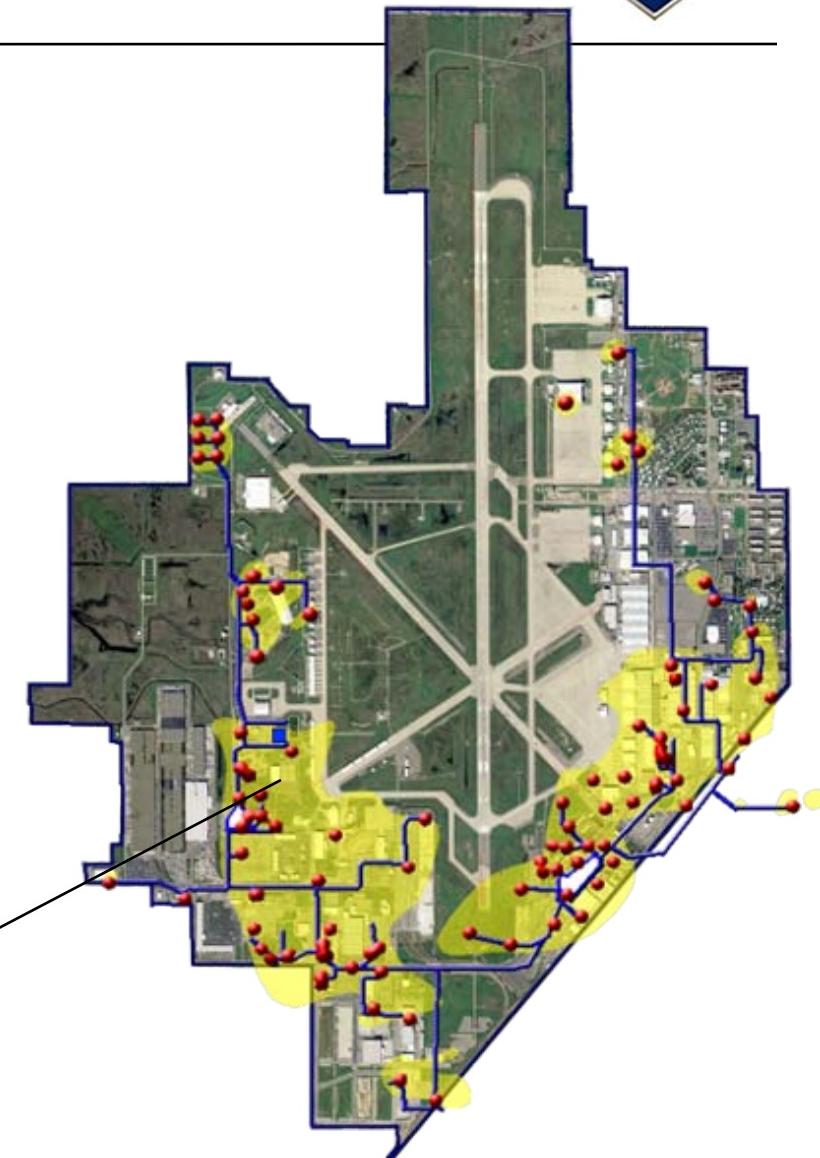
“Right sizing” of programs has resulted in green successes in all four



# Groundwater Cleanup



- 100 extraction wells
- 500 monitoring wells
- Approximately 1,450 gallons per minute
- More than 65,000 lbs of VOCs removed from 16 billion gallons of water



# Right Sizing Groundwater Treatment



- Implemented air stripping alone as treatment for meeting de minimus VOC discharge standards (<2 lbs/day)
  - Eliminated energy-intensive thermal processes
  - Eliminated liquid-phase granular activated carbon (LGAC) to polish air stripper effluent
- Reduced overall carbon footprint
  - LGAC backwash
  - Carbon reactivation

Saves more than \$200,000/year in utility costs



# Right Sizing Groundwater Treatment



- Eliminated satellite groundwater treatment system
  - Air stripper pre-treated hot spot before transporting water to main GWTP
  - As VOC concentrations were reduced, system became redundant
  - Reduced greenhouse gas production and realized energy savings of \$40,000/yr.



# Right Sizing Groundwater Treatment



- Downsized hexavalent chromium ion exchange treatment system in 2009
  - Replaced two 500-cubic-foot resin vessels with one 60-cubic-foot resin vessel
  - Eliminates excess resin regeneration
  - Saves more than \$100,000 per year in decreased utility costs, resin subcontractor costs, and disposal fees



# Right Sizing Groundwater Treatment



- Sampling
  - Converting from purge and bail to passive Hydrasleeve
    - Eliminates purge water generation
    - Eliminates onsite pump generator
  - Investigating solar power for long-term, sustainable energy



- Private firm to install and operate solar atop capped landfill (SVE) and at GWTP
- Air Force to purchase power through Power Purchase Agreement

# Right Sizing Groundwater Treatment

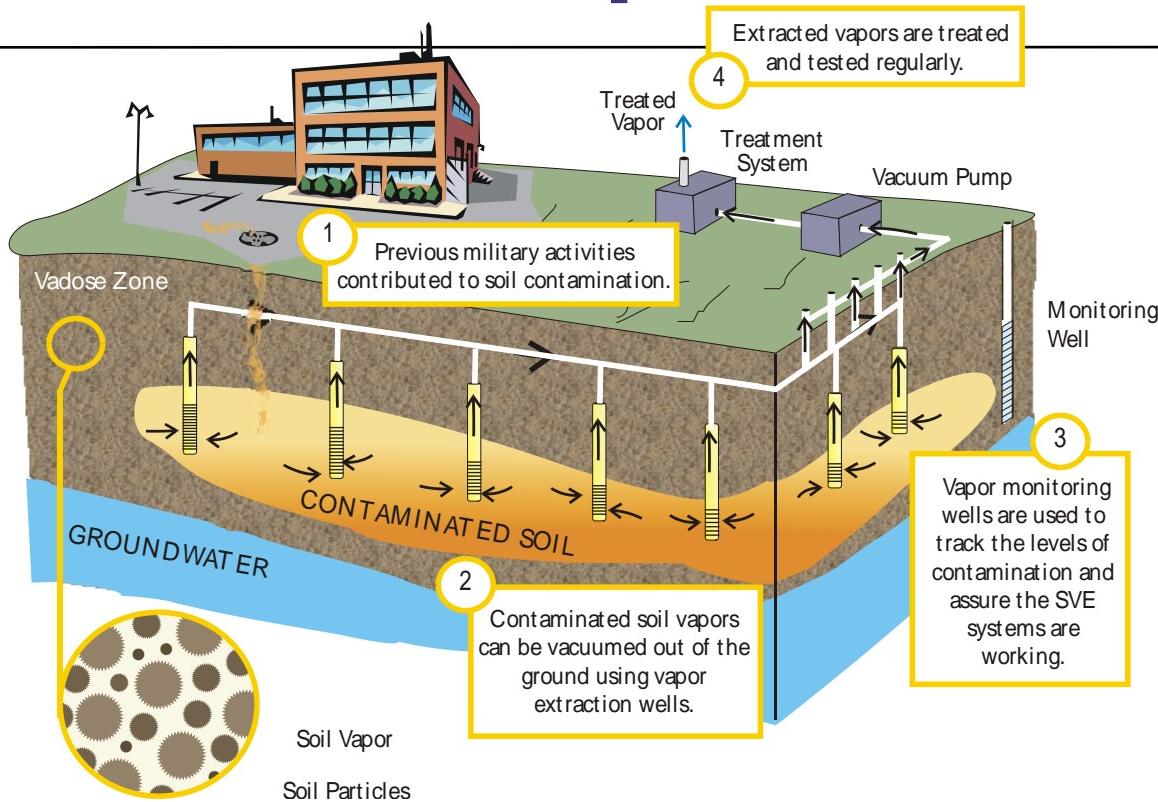


- Implemented performance-based contract at former Davis Global Communication Site for groundwater cleanup
  - Existing pump and treat system replaced with sustainable in-situ bioremediation (passive vegetable oil injection)
  - Cost to complete reduced by \$15,000,000, along with reduced energy usage and greenhouse gas production





# Soil Vapor Extraction



**Soil vapor** is the gas in the spaces between soil particles underground.

**Soil Vapor Extraction** vacuums vapors below ground and treats them. The byproduct is harmless.

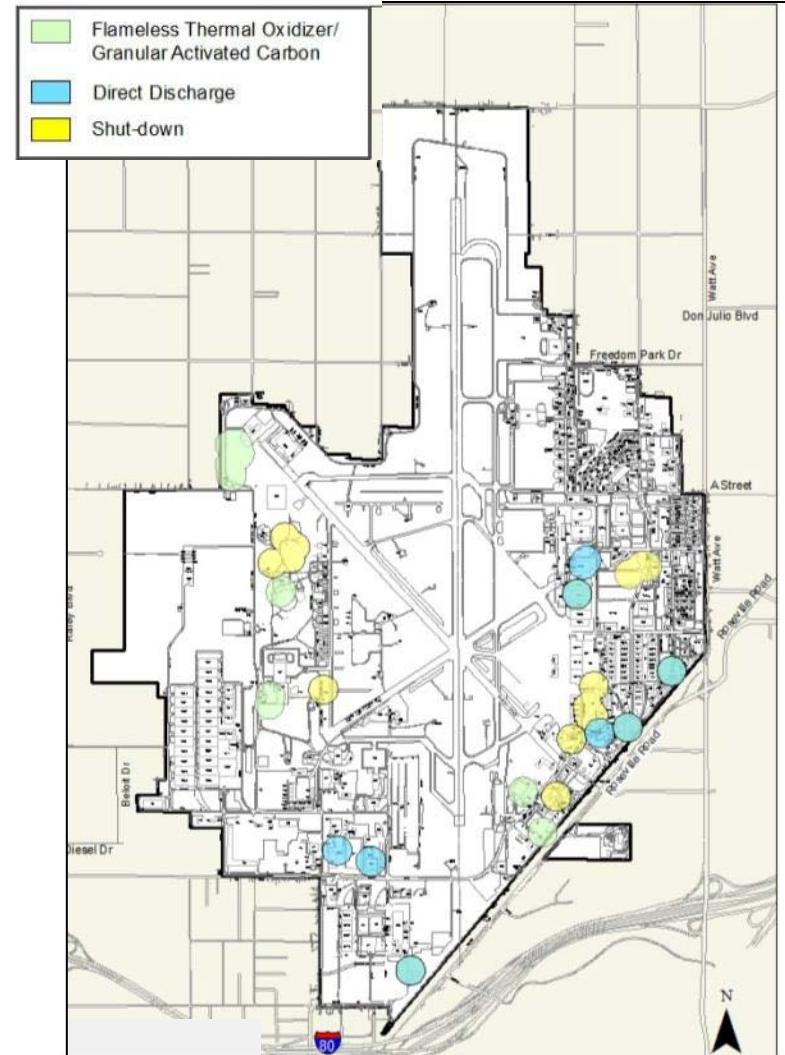
- Originally 16 systems pulling from 26 well fields
  - More than 1.5 million pounds of VOC contamination removed to date
  - Many plumes reduced to the point SVE systems no longer needed
- Projected for 2011, 12 systems pulling from 8 well fields



# Right Sizing Soil Vapor Extraction



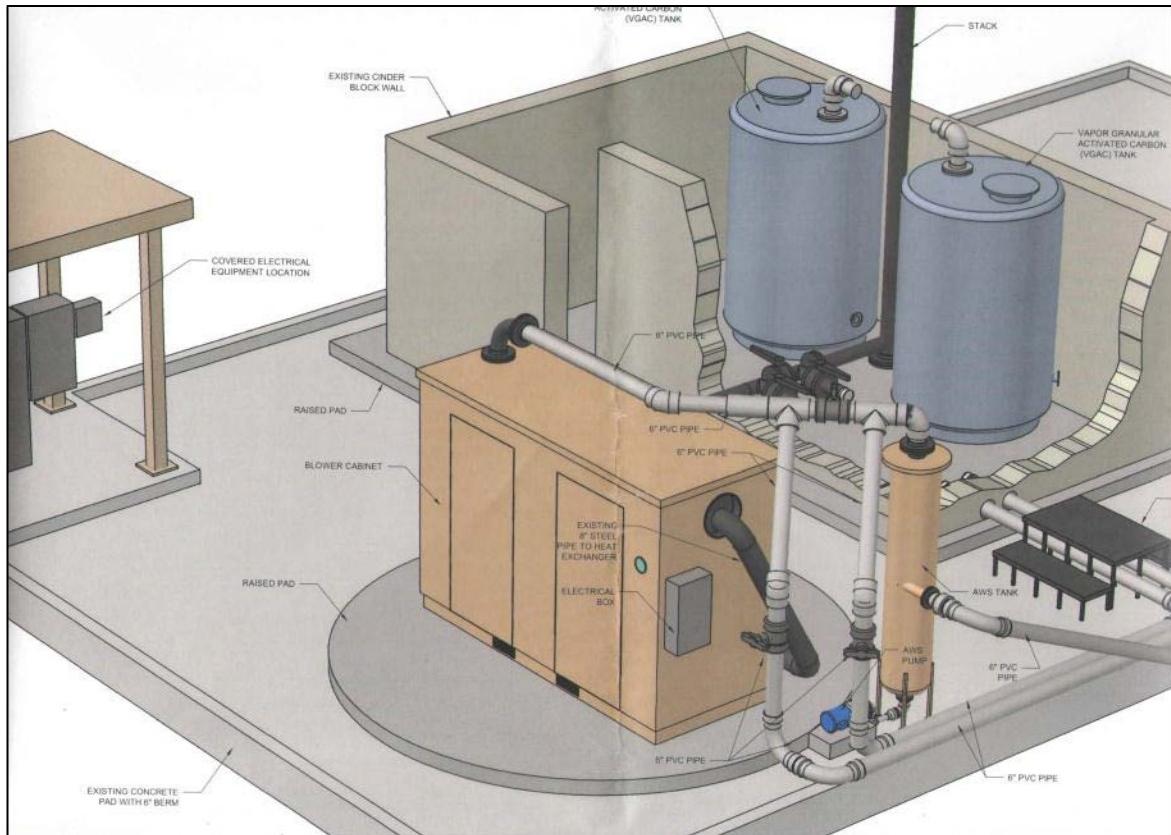
- Optimizing well locations and shutting down units
- Aggressively reducing carbon footprint
  - eliminating thermal treatment processes
  - eliminating granular activated carbon for end stream polishing
- Some plumes meeting de minimus and using direct discharge



# Right Flow Soil Vapor Extraction



Optimize soil vapor treatment by modifying flow route through blower either pre- or post-carbon treatment



# Right Flow Soil Vapor Extraction



- Post-treatment flow through blower in summer reduces heat exchanger water use
  - Saves 450,000 gallons of water per system per year
  - Maintains optimal carbon adsorption





# Fuels Bioventing

- In-Situ treatment of fuel contamination
  - Low carbon footprint
    - Small blower
  - Avoids excavation, transportation, and landfill disposal
  - Uses less energy than thermal desorption





# Soil Remediation

## AFCEE Sustainable Remediation Tool Model

- Alternatives analysis in feasibility study phase for more than 200 sites
  - Greenhouse gas generation and energy consumption
    - Off-site disposal vs. on-site consolidation of contaminated soil
  - Habitat impact in sensitive habitats
    - Excavate of contaminants vs. leave in place





# Questions?

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